

PATENT
CUSTOMER NO. 66882
ATTORNEY DOCKET NO. NM 7520

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: William J. COLUCCI, et al.)
Application No.: 10/670,552) Group Art Unit: 1714
Filed: September 25, 2003)
For: Fuels Compositions and Methods for)
Using Same)
)
)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Declaration by William J. Colucci

Dear Sir:

I, William J. Colucci, declare and say:

1. I am a co-inventor of the present patent application. I have been continuously employed by the assignee of the present application, Afton Chemical, and its predecessor in interest, since March 1990. My current title is Senior Research and Development Advisor. I have a Bachelor of Science degree in Organic Chemistry from Louisiana State University. I have studied the Office Action of February 8, 2007 in this case and the amended claims presented concurrently herewith. Similarly, I have restudied the present application. I submit this Declaration in support of patentability of the present application.

2. In the Office Action, the Examiner states that it would be obvious to optimize the ratio of Mannich detergent to succinimide found in the fuel additive of U.S. Patent No. 6,458,172 (Macduff) to achieve my subject invention. However, additives to reduce intake valve deposits, as taught by Macduff, do not work the same in DIG engines. It is known to those skilled in the art that some IVD reduction additives may also reduce DIG injector deposits. However, it is also known that some additives effective to reduce IVDs have little or no effect with respect to reducing DIG injector deposits. Stated another way, simply because an additive reduces IVDs does *not* mean that it will definitely reduce DIG injector deposits. The deposits in a typical port injected engine on the intake valves are not formed, do not act, and cannot necessarily be reduced in the same manner as deposits formed in a DIG engine.

3. An IVD-reducing additive cannot merely be optimized for use in a DIG engine because one of skill in the art would *not* expect the IVD-reducing additive to reduce injector deposits in the same manner, if at all, in a DIG engine. IVD-reducing additives may have no effect or may reduce performance in a DIG engine. Basically, one skilled in the art would not necessarily make any connection between the performance of an IVD-reducing additive in a conventional engine and the performance of that same additive in a DIG engine. It is incorrect to say that one of skill in the art would recognize the composition of Macduff to reduce or remove injector deposits in a DIG engine.

4. In fact, I have found that additives that perform very well in IVD testing do not necessarily function as good DIG injector detergent additives or are otherwise not suitable for use in DIG engine. Relocation of fuel injectors from behind the intake valves in conventional gasoline spark ignited engines to the cylinder in DIG engines

subjects these injectors to higher temperatures that promote coking. Studies show that injector coking results in fuel flow loss that significantly impacts the operation of DIG engines.

5. The currently claimed ratio of Mannich detergent to succinimide is critical to the operation of the claimed method. The claimed trace amount of succinimide to Mannich detergent is a critical balance that was previously not identified or recognized.

6. The following table reflects data gathered during flow loss testing for DIG injector performance:

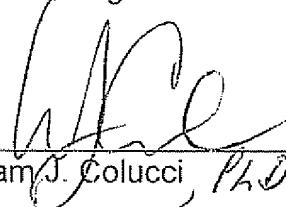
Test #	Additive 1	Additive 1		Additive 2	Treat Rate (PTB)	Flow loss After 6 hrs (%)
		Treat Rate (PTB)	Additive 2			
1	None		None			13.1
2	Cresol Mannich	60	None			9.0
3	Cresol Mannich	58	Succinimide	2		3.3
4	Cresol Mannich	49	Succinimide	11		4.9
5	Cresol Mannich	38	Succinimide	22		5.7
6	Cresol Mannich	29	Succinimide	31		8.0
7	Succinimide	2	None			9.4
8	Succinimide	29	None			8.8

The above data, reflected in Table 4 of the application as filed, was conducted in accordance with the procedures as outlined in the specification of the subject application. The above table is a simplified rearrangement of the data also shown in Table 4 and further corrects a typographical error located in the application as filed.

7. As the table above illustrates, a succinimide alone, a Mannich alone, and a Mannich/succinimide additive are not significantly effective at reducing flow loss in a DIG engine. Comparing tests 7 and 8, it is evident that adding a succinimide alone at a *higher* treat rate resulted in a modest, improved flow loss. Yet, counter-intuitively, it was found that the combination of a Mannich with only a trace amount of succinimide produced exceptional flow loss results (Test 3). Reducing the succinimide treat rate in combination with a Mannich detergent proved to be most effective. This is an unexpected and counter-intuitive result unique to DIG engines.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: May 8, 2007



William J. Colucci, PhD